

Appl. No. 09/917,961
Reply to Final Office Action Dated 4/12/2006

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A digital image capturing device that enables a user to capture a single image of an object, comprising:

- a shutter button;
- an electronic imaging sensor device comprising a plurality of pixels;
- an electronically actuatable shutter device comprising a plurality of individually addressable and actuatable shutter elements, each of said plurality of individually addressable shutter elements substantially corresponding to at least one of said plurality of pixels;
- ~~a storage medium that stores a plurality of exposure patterns; and~~
- ~~a processor that configured to (a) obtain a light level measurement, (b) automatically generate an exposure pattern based on the light level measurement, wherein the exposure pattern defines a first plurality of shutter elements and a second plurality of shutter elements and defines a first exposure time period for the first plurality of shutter elements and defines a second exposure time period for the second plurality of shutter elements, wherein the first exposure time period is greater than the second exposure time period, (a)-allows a user to select one of said stored plurality of exposure patterns, (b) completely applies the selected exposure pattern to said shutter device (c) actuate the first plurality of shutter elements for an amount of time equal to the first exposure time period and actuate the second plurality of shutter elements for an amount of time equal to the second exposure time period in response to activation of the shutter button to allow light reflected from the object whose image is to be captured to illuminate said imaging sensor through said selected exposure patterns such that the pixels corresponding to the first plurality of shutter elements are exposed to light for only the first exposure time period and the pixels corresponding to the second plurality of~~

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shutter elements are exposed to light for only the second exposure time period, and (e) records (d) record on a storage device only a single image of the object in response to activation of the shutter button and as a result of the complete application of the selected exposure pattern.

2. (Original) The apparatus of claim 1, wherein said imaging sensor device comprises a two-dimensional array of pixel elements and said shutter device comprises a LCD element comprising a two-dimensional array of individually addressable and actuatable shutter elements corresponding to said two-dimensional array of pixel elements.

3. Cancelled.

4. (Original) The apparatus of claim 1, wherein said shutter device comprises a microelectromechanical shutter element comprising a two-dimensional array of individually addressable and actuatable shutter elements.

5. (Original) The apparatus of claim 1, further comprising a memory including an address storage capable of storing one or more shutter element addresses.

6. Cancelled

7. (Currently Amended) The apparatus of claim 1, wherein ~~at least one of said exposure patterns specify~~ pattern specifies a plurality of exposure time periods, wherein each of said plurality of exposure time periods corresponds to a different plurality ~~corresponding to a plurality of shutter elements to be actuated.~~

8. (Original) The apparatus of claim 1, wherein said shutter device is formed on and is substantially co-planar with said imaging sensor device.

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9. (Original) The apparatus of claim 1, wherein said shutter device is assembled with and substantially co-planar with said imaging sensor device.

10-15. Cancelled

16. (Currently Amended) A light shuttering method for a still image capturing device, comprising the steps of:

providing an electronic imaging sensor device comprising a plurality of pixel elements;

providing an electronically actuated shutter device comprising a plurality of individually addressable and actuatable shutter elements, each shutter element substantially corresponding to at least one of said plurality of pixel elements; and

~~providing a storage medium that stores a plurality of exposure patterns;~~

~~providing a processor that (a) allows a user to select one of said stored plurality of exposure patterns, (b) completely applies the selected exposure pattern to said shutter device in response to activation of a shutter button to allow light reflected from the object whose image is to be captured to illuminate said imaging sensor through said selected exposure pattern, and (c) records on a storage device only a single image of the object as a result of the complete application of the selected exposure pattern configured to:~~

(a) obtain a light level measurement,

(b) automatically generate an exposure pattern based on the light level measurement, wherein the exposure pattern defines a first plurality of shutter elements and a second plurality of shutter elements and defines a first exposure time period for the first plurality of shutter elements and defines a second exposure time period for the second plurality of shutter elements, wherein the first exposure time period is greater than the second exposure time period,

(c) actuate the first plurality of shutter elements for an amount of time equal to the first exposure time period and actuate the second plurality of shutter elements for an amount of time equal to the second exposure time period in response to activation of the shutter button to allow light reflected from the object whose image is to be captured to illuminate

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said imaging sensor such that the pixels corresponding to the first plurality of shutter elements are exposed to light for only the first exposure time period and the pixels corresponding to the second plurality of shutter elements are exposed to light for only the second exposure time period, and

(d) record on a storage device only a single image of the object in response to activation of the shutter button and as a result of the complete application of the selected exposure pattern.

17. (Original) The method of claim 16, wherein the providing said shutter device step comprises forming said shutter device on said imaging sensor device.

18. (Original) The method of claim 16, wherein the providing said shutter device step comprises providing a two-dimensional array of individually addressable shutter elements, wherein a pixel unit of said imaging sensor device is individually addressable, wherein a first shutter element of said pixel unit polarizes light according to a first polarization orientation and a second shutter element of said pixel unit polarizes light according to a second polarization orientation that is substantially orthogonal to said first polarization orientation, and wherein the method provides a substantially non-polarized light to said imaging sensor device.

19. (Original) The method of claim 16, further including a step of storing a shutter actuation pattern that specifies a plurality of shutter elements to be actuated during an image capture.

20. (Original) The method of claim 16, further including a step of storing a shutter actuation pattern that specifies a plurality of exposure time periods for a corresponding plurality of shutter elements.

21. Cancelled

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22. (Currently Amended) The apparatus of claim 21, wherein said ~~at least one of said exposure patterns~~ pattern further specifies a third ~~group~~ plurality of shutter elements and a third exposure time period for the third ~~group~~ plurality of shutter elements, wherein the third exposure time period is greater than the first exposure time period.

23. Cancelled

24. (Currently Amended) The apparatus of claim 1, ~~wherein at least one of said exposure patterns specifies a first group of shutter elements and a second group of shutter elements, wherein said first group~~ plurality of shutter elements includes one or more shutter elements that are not included in said second ~~group~~ plurality of shutter elements, and wherein said ~~at least one of said shutter exposure patterns also specifies a first opacity level for the first group of shutter elements and a second opacity level for the second group of shutter elements, wherein the first opacity level is greater than the second opacity level.~~

25. (Currently Amended) The method of claim 16, ~~wherein the selected exposure pattern specifies at least a first group of said shutter elements and a second group of said shutter elements, wherein said first group~~ plurality of shutter elements includes one or more shutter elements that are not included in said second ~~group~~ plurality of shutter elements.

26-30. Cancelled

31. (New) In a camera comprising a shutter button; an electronic imaging sensor device comprising a plurality of pixels; and an electronically actuatable shutter device comprising a plurality of individually addressable and actuatable shutter elements, wherein each of the plurality of individually addressable shutter elements substantially correspond to at least one of the plurality of pixels, a method for capturing an image of an object, comprising:

obtaining a light level measurement;

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automatically generating an exposure pattern based, at least in part, on the light level measurement, wherein the exposure pattern defines a first plurality of shutter elements and a second plurality of shutter elements and defines a first exposure time period for the first plurality of shutter elements and defines a second exposure time period for the second plurality of shutter elements, wherein the first exposure time period is greater than the second exposure time period; and

in response to a user fully depressing the shutter button:

(a) actuating the first plurality of shutter elements for an amount of time equal to the first exposure time period and actuating the second plurality of shutter elements for an amount of time equal to the second exposure time period to allow light reflected from the object to illuminate the electronic imaging sensor such that the pixels corresponding to the first plurality of shutter elements are exposed to light for only the first exposure time period and the pixels corresponding to the second plurality of shutter elements are exposed to light for only the second exposure time period; and

(b) recording only a single image of the object on a non-volatile storage device, wherein step (b) occurs after step (a).

32. (New) In a camera comprising a shutter button; an electronic imaging sensor device comprising a plurality of pixels; and an electronically actuatable shutter device comprising a plurality of individually addressable and actuatable shutter elements, wherein each of the plurality of individually addressable shutter elements substantially correspond to at least one of the plurality of pixels, a method for capturing an image of an object, comprising:

obtaining a light level measurement;

automatically generating an exposure pattern based, at least in part, on the light level measurement; wherein the exposure pattern defines a first plurality of shutter elements and a second plurality of shutter elements and defines a first exposure opacity level for the first plurality of shutter elements and defines a second exposure opacity level for the second plurality of shutter elements, wherein the first exposure opacity level is greater than the second exposure opacity level; and

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in response to a user fully depressing the shutter button:

(a) actuating the first plurality of shutter elements so that the first plurality of shutter elements has an opacity equal to the first exposure opacity level and actuating the second plurality of shutter elements so that the second plurality of shutter elements has an opacity equal to the second exposure opacity level, thereby allowing light reflected from the object to illuminate the electronic imaging sensor such that the pixels corresponding to the first plurality of shutter elements are exposed to a different amount of light than the pixels corresponding to the second plurality of shutter elements; and

(b) recording only a single image of the object on a non-volatile storage device, wherein step (b) occurs after step (a).

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